(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 052 133 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
15.11.2000 Bulletin 2000/46

(51) Int. Cl.[7]: B60K 35/00

(21) Application number: 00830342.2

(22) Date of filing: 10.05.2000

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: 14.05.1999 IT TO990404

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(54) Instrument panel for motor-vehicles having an auxiliary display system which can be activated by electrostatic petals.

(57) An instrument panel for motor vehicles comprises a transparent screen (6) placed in front of an indicator instrument (4). Associated to the transparent screen (6) is at least one electrostatically operating petal (10) which can be displaced, by applying an electric voltage, from a non-operative condition, in which it is curled up or curved, so as to enable the indicator instrument (4) to be seen, to an operating condition, in which it lays down over the transparent screen (6) and hides the indicator instrument (4) from view. The electrostatically operating petal (10) presents a reflecting surface whereby, in its operating condition, where it is distended over the screen (6), it reflects in the direction of the driver the image of an auxiliary display (12) placed on the opposite side of the transparent screen (6) with respect to the indicator instrument (4).

Fig_1

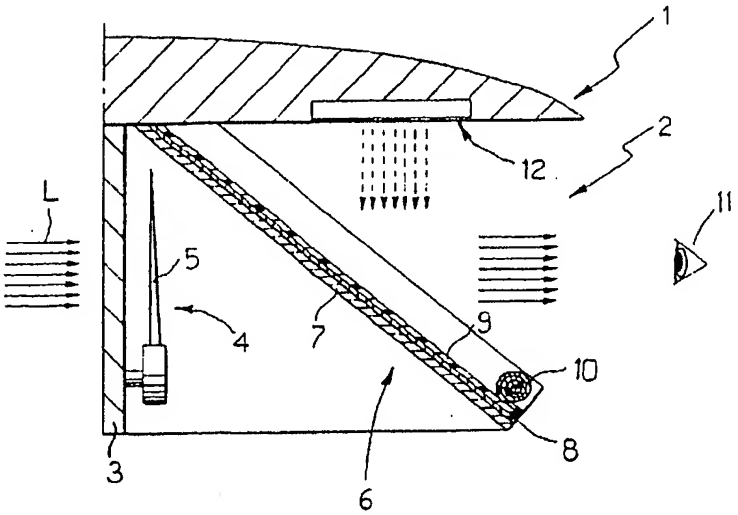

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Fig_1

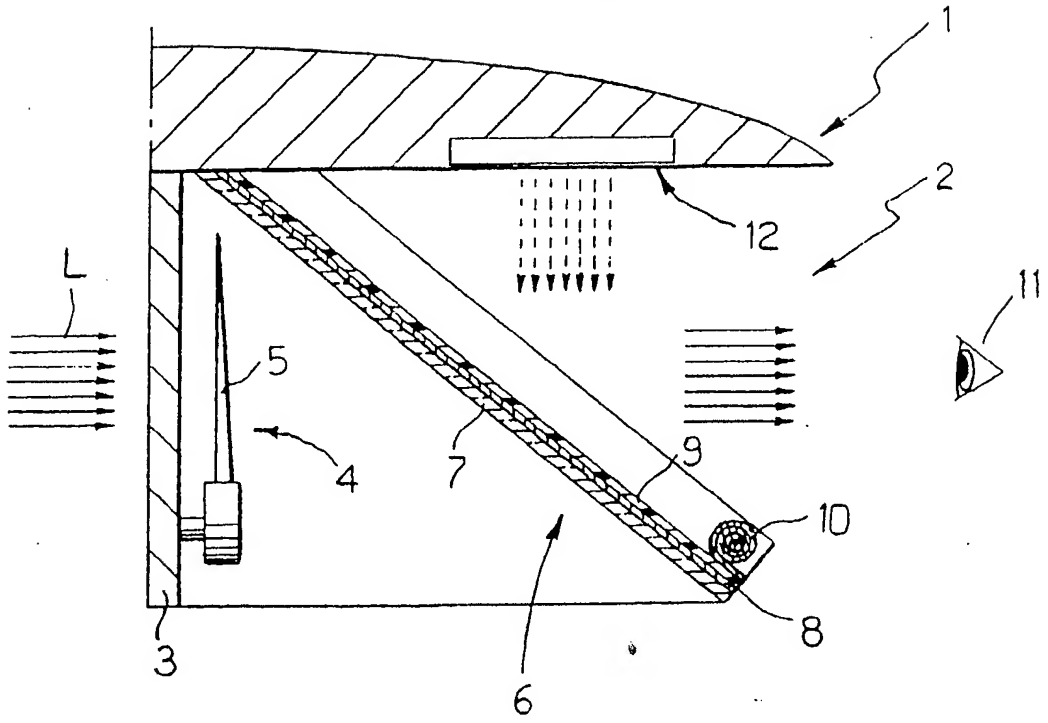


Fig_2

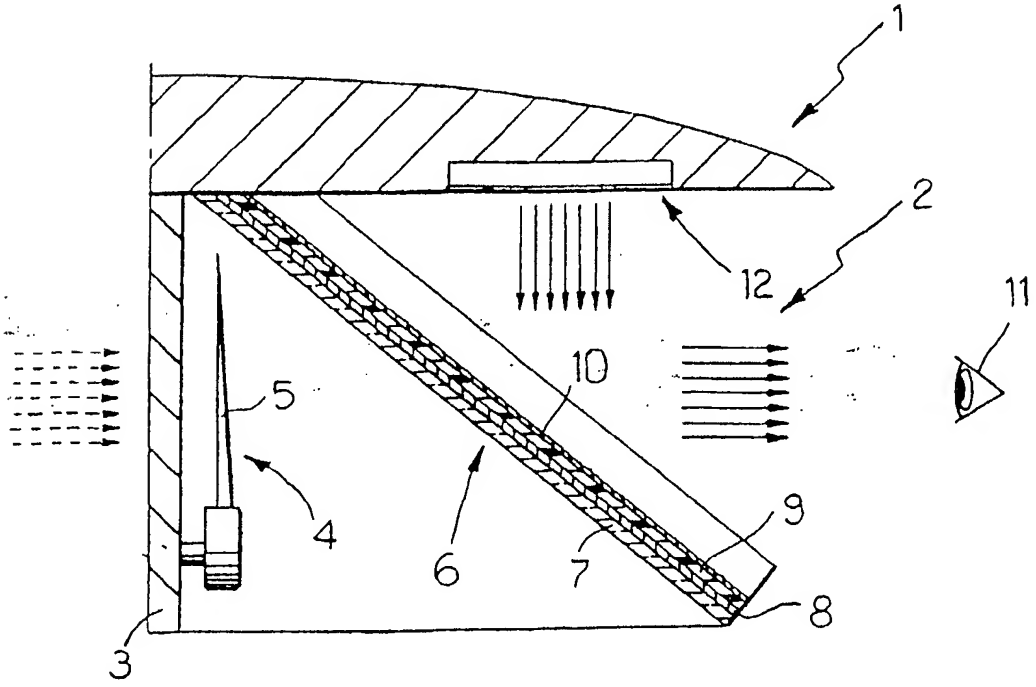


Fig_3

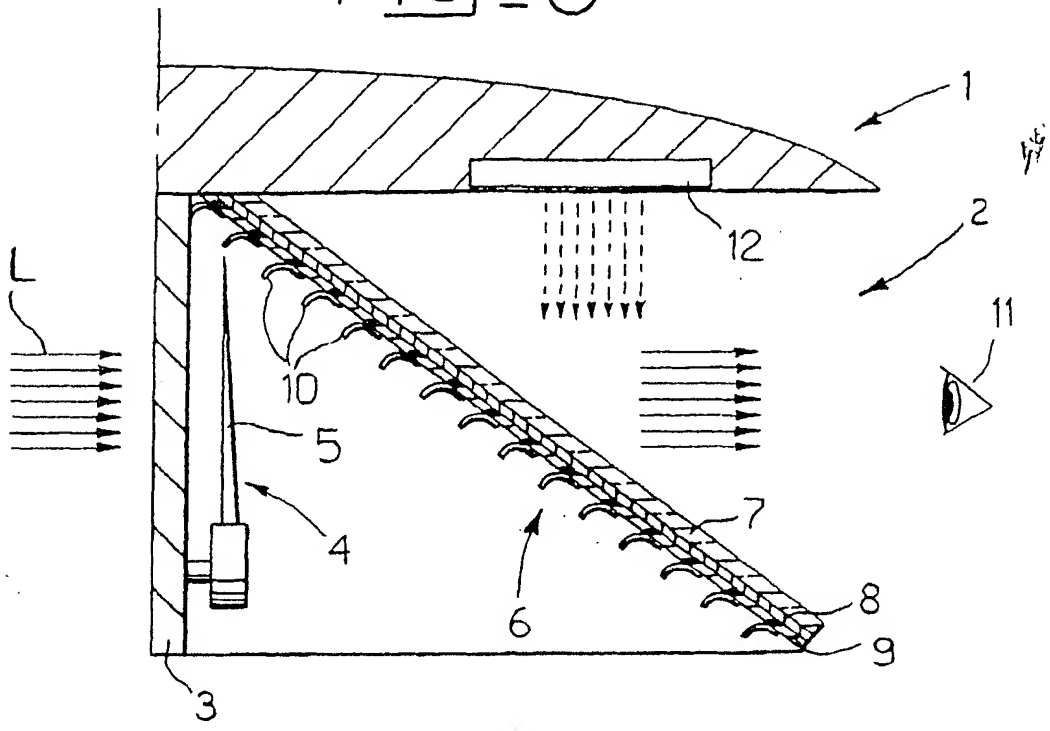
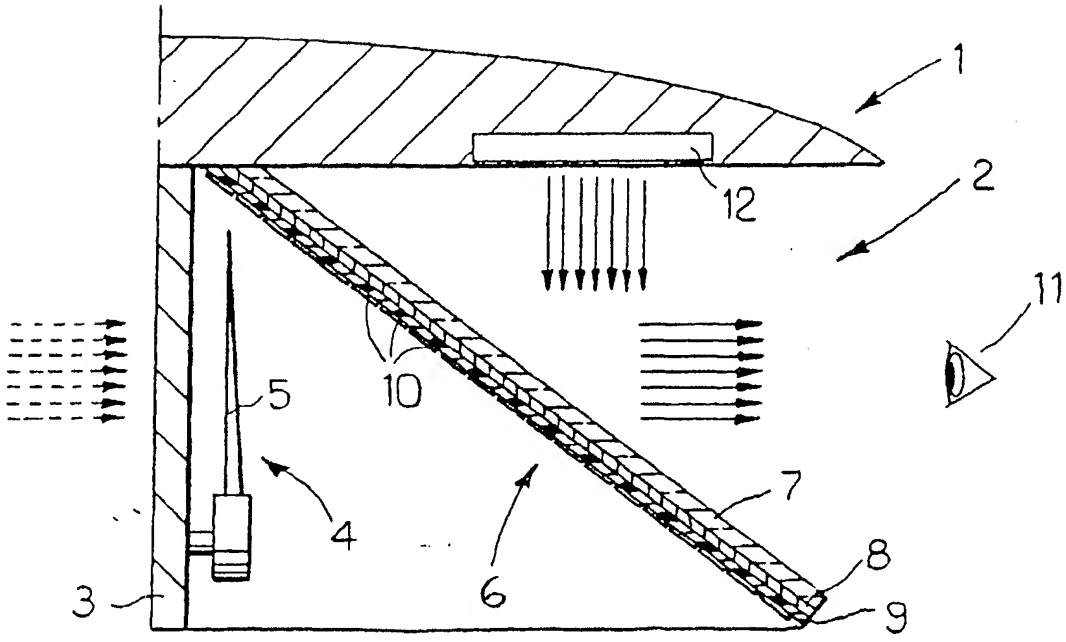


Fig_4



Description

[0001] The present invention relates to instrument panels for motor-vehicles, of the type comprising a support carrying at least one indicator instrument and a transparent screen placed in front of the support.

[0002] The purpose of the present invention is to provide an instrument panel of the type specified above that is able to display a high number of items of information in a relatively reduced space and that at the same time presents a simple and inexpensive structure.

[0003] With the aim of achieving the above purpose, the subject of the present invention is an instrument panel of the type specified above, characterized in that

> associated to said transparent screen is at least one lamina or "petal" in the form of an electrically conductive thin film which is connected at one end to the transparent screen and co-operates with an electrode in the form of a layer of transparent material applied on the transparent screen, said petal being displaceable by electrostatic effect from a curved or curled-up condition of rest. in which the indicator instrument is visible through said transparent screen, to an operating condition, in which said petal hides said indicator instrument from view, following upon application of an electric voltage between said petal and said electrode,
> said instrument panel comprising an auxiliary display set on the opposite side of the transparent screen with respect to the indicator instrument and facing said transparent screen, and
> said petal having a reflecting surface, whereby, in its operating position, it hides the indicator instrument from view but reflects instead the image of the auxiliary display in the direction of the driver.

[0004] Thanks to the above characteristics, the instrument panel according to the invention is able to supply the driver with a great deal of information, notwithstanding the fact that it occupies a relatively small space. The technology usable for making the electrostatic petal is similar to the one that has been employed for some time now in low-power small-sized electrostatic motors suitable for use as actuators in microelectronic-technology applications, for operating mechanical devices and the like in conditions where vibrations occur. such as in the automobile field. Said electrostatic actuators use flexible laminas, also referred to as "lashes". or "petals", that are electrically conductive and each of which has one end associated to a stator and the opposite end adjacent to a translator. The application of voltage pulses between the petals and an electrode associated to the translator causes adhesion by the electrostatic effect of the petals to the translator, with consequent movement of the latter with respect to the stator.

[0005] An actuator of the type specified above is , for example, described in Dyatlov V.L., Konyaskin V.V., Potapov B.S., and Pyankov Y.A., "Prospects of the Employment of Synchrotron Radiation in Film Electrostatic Actuator Technology", Nuclear Instruments and Methods in Physics Research, A359 (1995), Pages 394-395.

[0006] The instrument panel according to the invention exploits to advantage the technology described above in order to be able to supply the driver with a great deal of information without involving the use of a cumbersome structure.

[0007] In one first embodiment of the invention, a single electrostatic petal is envisaged which is designed to cover the transparent screen entirely in its operating condition and to roll up on one side of the screen in its resting condition. In one second embodiment, associated to the transparent screen is a matrix of petals in the form of micro-mirrors, each of which has one end connected to the screen and the opposite end free, the latter free end being set at a distance from the instrument panel in a resting, i.e., curled-up, condition of the corresponding petal.

[0008] Further characteristics and advantages of the invention will emerge from the ensuing description referring to the annexed drawings, which are provided merely as non-limiting examples. and in which:

> Figures 1 and 2 are sectional views of one first embodiment of the instrument panel according to the invention in two different operating conditions, and
> Figures 3 and 4 illustrate one second embodiment of the panel according to the invention in two different operating conditions.

[0009] With reference to Figure 1, number 1 indicates, as a whole, the dashboard of a motor vehicle, including an instrument panel 2 which comprises a fixed support 3 that carries at least one indicator instrument 4 including a pointer 5 co-operating with a graduated scale appearing on a surface of the support 3. The fixed structure of the instrument panel 2 further supports a transparent screen 6 set inclined, as illustrated in the drawings, in front of the indicator instrument 4.

[0010] The transparent screen 6 includes a lamina 7 made of glass or transparent plastic and having a thickness of a few millimetres or centimetres. A layer 8 of light-transparent conducting material (for example indium tin oxide - ITO) having a thickness of a few tens or hundreds of nanometres is formed on the surface of the lamina 7 by evaporation or spin-coating or silk-screen printing or dipping. The layer 8 is designed to form an electrode. Subsequently, the electrode 8 is insulated with a layer 9 of light-transparent dielectric or ferro-electric insulating material, the thickness of which may range between 0.1 μm to a few tens of microns. This layer may be obtained by silk-screen printing or

spin-coating or dipping.

[0011] The reference number 10 designates a metallic film having a thickness of a few fractions of a micron constituting the petal. The petal 10 is fixed at one end to the surface of the substrate 6. A metallic film is used that has a certain radius of curvature in such a way that, if no electric voltage is applied, the film remains curled up as shown in Figure 1, on one side off the transparent screen 6, so that the indicator instrument 4 is visible to the eye 11 of the driver through the screen 7, possibly with the aid of a luminous flux L coming from the area behind the supporting wall 3.

[0012] When an electric voltage is applied between the petal 10 and the electrode 8, the film 10 spreads out by the electrostatic effect on the surface of the substrate, thus hiding the indicator instrument 4 from the driver's sight (see Figure 2).

[0013] According to an important characteristic of the invention, the external surface of the film 10 is reflective, so as to work as a mirror. In the operating, i.e., distended, condition illustrated in Figure 2, the film 10 is therefore able to reflect towards the driver's eye 11 the image of an auxiliary display 12 which is located on the opposite side of the transparent screen 6 with respect to the indicator instrument 4 and which is set facing the screen. In the example illustrated, the auxiliary display 12 is set horizontally above the transparent screen 7, which reflects the image of the auxiliary display 12 towards the driver's eyes. The auxiliary display 12 may be made in any known way and employing any technology.

[0014] Thanks to the arrangement described above, the driver is in a position to switch the instrument panel from the condition illustrated in Figure 1 to the condition illustrated in Figure 2, so as to have available further information that may be drawn from the auxiliary display 12, without thereby the instrument panel 2 involving additional encumbrance in the dashboard of the motor vehicle.

[0015] Figures 3 and 4 illustrate the two corresponding operating conditions of a variant of the panel according to the invention, which differs from the embodiment described above only in the respect that, instead of being provided with a single electrostatic petal 10, it comprises a matrix of petals in the form of micro-mirrors. In the example illustrated in Figures 3 and 4, moreover, the petals, again designated by the reference number 10, are set on the internal face of the transparent screen 6. Each petal 10 presents a resting, i.e., curled-up, condition with one end connected to the substrate and one free end set at a distance from the substrate, so as to allow the indicator instrument 4 to be seen. In the operating condition resulting from application of an electric voltage between the petals 10 of the electrode 8, all the petals of the matrix adhere to the substrate, so as to hide the indicator instrument 4 and reflect the image of the auxiliary display 12. In this case, the reflecting surface of each petal 10 is the internal one, i.e., the one facing the transparent screen 6.

[0016] Of course, without prejudice to the principle of the invention, the details of construction and the embodiments may vary widely with respect to what is herein described and illustrated purely to provide an example, without thereby departing from the sphere of the present invention.

Claims

1. An instrument panel for motor vehicles, comprising a support (3) carrying at least one indicator instrument (4), and a transparent screen (6) placed in front of the support (3),
characterized in that:

   associated to said transparent screen (6) is at least one petal (10) in the form of an electrically conductive thin film which is connected at one end to the transparent screen (6) and co-operates with an electrode (8) in the form of a layer of transparent metallic material applied on the transparent screen (6), said petal being displaceable by electrostatic effect from a curved or curled-up condition of rest, in which the indicator instrument (4) is visible through said transparent screen, to an operating condition, in which said petal (10) hides said indicator instrument (4) from view, following upon application of an electric voltage between said petal (10) and said electrode (8),
   said instrument panel comprising an auxiliary display (12) placed on the opposite side of the transparent screen (6) with respect to the indicator instrument (4) and facing said transparent screen (6), and
   said petal (10) having a reflecting surface, whereby, in its operating position, it hides the indicator instrument (4) from view but reflects instead the image of the auxiliary display (12) in the direction of the driver.

2. An instrument panel according to Claim 1, characterized in that it is provided with a single petal (10) designed to cover the transparent screen (6) entirely in its operating condition and to roll up on one side of the screen (6) in its resting condition.

3. An instrument panel according to Claim 1, characterized in that associated to said transparent screen (6) is a matrix of electrostatic petals (10) in the form of micro-mirrors, each of which has one end connected to the screen (6) and the opposite end free, said free end being set at a distance from the transparent screen (6) in the resting condition of the corresponding petal.

4. An instrument panel according to Claim 1, charac-

terized in that the transparent screen (6) comprises a transparent glass or plastic lamina and in that said electrode (8) consists of a layer of light-transparent conductive material applied by evaporation, or spin-coating, or silk-screen printing, or dipping.

5. An instrument panel according to Claim 1, characterized in that the aforesaid electrode (8) is covered by a transparent dielectric or ferro-electric insulating layer (9).